Smallpox Bibliography
January 2004

1: Am J Bioeth. 2003 Winter;3(1):W-IF 1.

Smallpox revisited?

Selgelid MJ.

University of the Witwatersrand, South Africa.

This article reviews the history of smallpox and ethical issues that arise with its threat as a biological weapon. Smallpox killed more people than any infectious disease in history--and perhaps three times more people in the 20th Century than were killed by all the wars of that period. Following a WHO-sponsored global vaccination campaign, smallpox was officially declared eradicated in 1980. It has since been revealed that the Soviet Union, until its fall in the early 1990s, manufactured tens of tons of smallpox for military purposes. A worry is that some of this may have fallen into the hands of "rogue" nations or terrorists. Current U.S. debate questions whether smallpox vaccine should therefore be made available to the American public, which--like the rest of the world--now lacks immunity. Because the vaccine is considerably dangerous, public dialogue cannot resolve this matter if evidence material to the likelihood of attack is classified (i.e. secret). I conclude by recommending numerous future areas for ethics research related to the weaponization of smallpox.

PMID: 14560713 [PubMed - indexed for MEDLINE]

2: Am J Med. 2003 Nov;115(7):570-2.

Vaccinating health care workers against smallpox in an isolated primary care facility.

Lesho EP, Schissel DJ, Harris MD.

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Publication Types:
Multicenter Study

PMID: 14599637 [PubMed - indexed for MEDLINE]

3: Ann Emerg Med. 2003 Nov;42(5):665-80.

Comment in:
Ann Emerg Med. 2003 Nov;42(5):681-4.
Ann Emerg Med. 2003 Nov;42(5):685-8.

Emergency medicine tools to manage smallpox (vaccinia) vaccination complications: clinical practice guideline and policies and procedures.

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In December 2002, the federal government began a program to immunize approximately 500000 civilian public health and health care workers with smallpox (vaccinia) vaccine as a part of our pre-event defense against bioterrorism. First responders will likely follow, and the general US population might be offered vaccination in the next 1 to 2 years. Recent reports that suggest the possible association of the vaccine to adverse cardiac events (including deaths), liability concerns for hospitals, and the availability of compensation for workers with vaccine complications have significantly reduced
voluntary participation. Vaccinees might experience robust primary takes or serious adverse events, including viral or even bacterial cellulitides, encephalitis, progressive skin destruction, and other life-threatening complications. With the increasing prevalence of immune suppression from bothdiseases and immunosuppressive medications, complications might be seen in higher frequency than previously reported. Emergency medicine providers and staff must become familiar with clinical presentations and management of vaccine complications. In addition, policies and procedures must be developed to prevent
unimmunized providers from inadvertently contacting the active vaccination sites of their patients and, if the providers themselves have active vaccination sites, to protect their patients and their own families.

Publication Types:
Review
Review, Tutorial

PMID: 14581920 [PubMed - indexed for MEDLINE]

4: Ann Emerg Med. 2003 Nov;42(5):681-4.

Comment on:
Ann Emerg Med. 2003 Nov;42(5):665-80.

The risks and benefits of pre-event smallpox vaccination: where you stand depends on where you sit.

Aragon TJ, Fernyak SE.

Publication Types:

Comment
Editorial
Review
Review, Tutorial

PMID: 14581921 [PubMed - indexed for MEDLINE]

5: Ann Emerg Med. 2003 Nov;42(5):685-8.

Comment on:
Ann Emerg Med. 2003 Nov;42(5):665-80.

Removing health care workers from clinical duties after smallpox vaccination: is it really necessary?

Darling RG, Waeckerle JF, Grabenstein CO, Koenig KL.

Publication Types:
Comment
Editorial

PMID: 14581922 [PubMed - indexed for MEDLINE]

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UK government denies that smallpox vaccination plans have fallen short of target.

Dyer O.

Publication Types:
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PMID: 14593029 [PubMed - indexed for MEDLINE]

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Cardiac dysrhythmia following smallpox vaccination.

Whitman TJ, Ferguson MA, Decker CF.

Publication Types:
Case Reports
Letter

PMID: 14614684 [PubMed - indexed for MEDLINE]

8: Colo Nurse. 2003 Jun;103(2):21.

Smallpox vaccination program update: April 2003.

Moorhouse M.

PMID: 12814087 [PubMed - indexed for MEDLINE]

9: Comp Immunol Microbiol Infect Dis. 2003 Oct;26(5-6):423-30.

Smallpox vaccination and bioterrorism with pox viruses.

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Bioterrorist attacks occupy a special place amongst the innumerable potential types of terrorist attack, with the intentional release of pox viruses being especially feared in this connection. Apart from the variola virus, the agent responsible for smallpox in humans, the monkeypox virus and numerous other animal pox viruses pose potential risks for humans and animals. This risk scenario also includes recombinations between the various pox viruses, changes in hosts and genetically engineered manipulations of pox viruses.For over 200
years, the method of choice for combatting smallpox was via vaccination with a reproductive, original vaccinia virus. Worldwide eradication of smallpox at the end of the 1970s and the discontinuation of routine smallpox vaccination in 1980 can be credited to such vaccination. Unfortunately, these vaccinations were associated with a large number of postvaccinal impairments, sometimes resulting in death (e.g. postvaccinal encephalitis). The only way to restrict such postvaccinal complications was to carry out initial vaccination within the first
2 postnatal years. Initial vaccination at a later age led to such a sharp increase in the number of vaccines with complications that vaccination had to be discouraged.The dilemma of the smallpox vaccine stocks stems from the fact that a large portion of these stocks are produced with the same vaccinia strains as before. This is irresponsible, especially as the percentage of immune-suppressed
persons in the population, for whom vaccination-related complications pose an especial threat, is increasing.One solution to the dilemma of the smallpox vaccine stocks is the MVA strain. It is harmless, protects humans and animals equally well against smallpox and can be applied parenterally.

Publication Types:
Review
Review, Tutorial

PMID: 12818626 [PubMed - indexed for MEDLINE]

10: Diagn Mol Pathol. 2003 Jun;12(2):103-7.

Rapid diagnosis of smallpox infection and differentiation from its mimics.

Nuovo GJ, Plaza JA, Magro C.

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The potential for a bioterrorism-induced smallpox outbreak has been much discussed of late. The literature of the late 1960s stressed that the distinction between smallpox and the other viral-induced vesicle-forming diseases, namely varicella zoster and disseminated herpes simplex, was difficult to make. Given that the cutaneous manifestations of smallpox would be among the initial symptoms, we reviewed 2 cases of smallpox diagnosed in South America in the 1970s in conjunction with 9 cases of multiple skin vesicles diagnosed as either disseminated herpes simplex or varicella-zoster. These were examined by routine hematoxylin and eosin stain (H&E) as well as by in situ hybridization. A blind review of the cases demonstrated that each showed striking intraepithelial vesicles containing multinucleated squamous cells exhibiting a ground glass appearance of the nuclear chromatin. Thus, as expected, routine H&E examination could not differentiate the 2 smallpox cases from the other 9 samples. In situ hybridization easily distinguished the 2 cases of smallpox from the other 9 samples, 5 of which contained varicella-zoster (two had been misdiagnosed as
herpes) and the other 4 were disseminated herpes simplex. The in situ test, readily accomplished in any histology-based molecular laboratory in 4 hours, allows for the rapid and specific identification of smallpox infection and, importantly, its distinction from its mimics. Formalin fixation, which is optimal for in situ hybridization, guarantees the inactivation of the smallpox virus.

PMID: 12766615 [PubMed - indexed for MEDLINE]

11: Epidemiol Infect. 2003 Oct;131(2):849-57.

Forecasting the geographical spread of smallpox cases by air travel.

Grais RF, Ellis JH, Glass GE.

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Instituting air travel restrictions to slow the geographical spread of smallpox cases would have significant consequences and present serious logistical concerns. Public health decision makers must weigh the potential benefits of such restrictions against their negative impact. The goal of this research is to provide a basic analytical framework to explore some of the issues surrounding the use of air travel restrictions as a part of an overall containment strategy. We report preliminary results of a compartmental model for the inter-city spread
of smallpox cases resulting from US domestic air travel. Although air traffic can be halted within hours as was shown following the terrorist attacks of 11 September 2001, these results suggest that the consequences of halting domestic air travel may not be outweighed by public health benefits.

PMID: 14596525 [PubMed - indexed for MEDLINE]

12: Fed Regist. 2003 Dec 16;68(241):70079-106.

Smallpox Vaccine Injury Compensation Program: administrative implementation. Interim final rule.

Health Resources and Services Administration, HHS.

The Smallpox Emergency Personnel Protection Act of 2003 (SEPPA), authorizes the Secretary of Health and Human Services (the Secretary), to establish the Smallpox Vaccine Injury Compensation Program ("the Program"). This program is designed to provide benefits and/or compensation to certain persons harmed as a direct result of receiving smallpox covered countermeasures, including the smallpox vaccine, or as a direct result of contracting vaccinia through certain accidental exposures. In addition, the Secretary may provide death benefits to certain survivors of individuals who died as the direct result of these injuries. On August 27, 2003, the Secretary published an interim final rule that set out a Smallpox (Vaccinia) Vaccine Injury Table ("the Table"). The table includes adverse effects (including injuries, disabilities, conditions, and deaths) within specific time periods that shall be presumed to result from the receipt of, or exposure to, the smallpox vaccine. The Secretary will use this table, as well as the procedures set out in this regulation, in deciding whether persons are eligible to receive benefits under the program. In this interim final rule, the Secretary is setting out the administrative policies, procedures, and requirements governing the program, as authorized by the SEPPA. The Secretary is seeking public comment on this interim final rule.

PMID: 14677536 [PubMed - indexed for MEDLINE]

13: J Clin Microbiol. 2003 Sep;41(9):4068-70.

Smallpox: residual antibody after vaccination.

Gallwitz S, Schutzbank T, Heberling RL, Kalter SS, Galpin JE.

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Of all the microorganisms and toxins, poxviruses (Orthopoxvirus) have the greatest potential for use by terrorists. These viruses can spread rapidly through the environment following initial infection. In 1980, the World Health Organization Eradication Program discontinued vaccination for smallpox and declared that the disease had been eliminated. With the threat of smallpox virus as a bioterrorism weapon, questions have been asked about the persistence of protection (as offered by antibodies) following vaccination with vaccinia virus vaccine. To address this, sera from 204 adults vaccinated as children were tested by enzyme immunoassay (EIA) for the presence of vaccinia virus antibody. Of the 204 individuals whose sera were examined for the presence of vaccinia antibody, 165 (80.9%) had been vaccinated once and 39 (19.1%) had been vaccinated at least twice. Of the 165 sera from individuals vaccinated once, 112 (67.9%) were positive. Of the 39 sera from individuals vaccinated more than once, 31 (79.5%) were positive. The presence of a vaccination scar at the time of blood collection was not determined. Fifty-six nonvaccinated individuals, under 30 years of age, were tested by EIA; four of these (7.1%) were positive for vaccinia virus antibody by EIA. Forty-four EIA-positive and 16 EIA-negative sera were also tested by serum neutralization

(SN) as a comparison with the EIA test results; one serum (negative by EIA) was SN positive. No attempt was made to ascertain any demographics other than age (date of birth) and "remembered" times of vaccination.

PMID: 12958227 [PubMed - indexed for MEDLINE]

14: J Eur Acad Dermatol Venereol. 2003 Jul;17(4):487-8.

Smallpox scars - the only evidence of an eradicated disease.

Verma SB.

Publication Types:
Letter

PMID: 12834478 [PubMed - indexed for MEDLINE]

15: J Infect Dis. 2003 Oct 15;188(8):1181-91. Epub 2003 Oct 10.

Modeling a safer smallpox vaccination regimen, for human immunodeficiency virus type 1-infected patients, in immunocompromised macaques.

Edghill-Smith Y, Venzon D, Karpova T, McNally J, Nacsa J, Tsai WP, Tryniszewska E, Moniuszko M, Manischewitz J, King LR, Snodgrass SJ, Parrish J, Markham P, Sowers M, Martin D, Lewis MG, Berzofsky JA, Belyakov IM, Moss B, Tartaglia J, Bray M, Hirsch V, Golding H, Franchini G.

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We have modeled smallpox vaccination with Dryvax (Wyeth) in rhesus macaques that had depletion of CD4(+) T cells induced by infection with simian immunodeficiency virus or simian/human immunodeficiency virus. Smallpox vaccination induced significantly larger skin lesions in immunocompromised macaques than in healthy macaques. Unexpectedly, "progressive vaccinia" was infrequent. Vaccination of immunocompromised macaques with the genetically-engineered, replication-deficient poxvirus NYVAC, before or after retrovirus infection, was safe and lessened the severity of Dryvax-induced skin lesions. Neutralizing antibodies to vaccinia were induced by NYVAC, even in macaques with severe CD4(+) T cell depletion, and their titers inversely
correlated with the time to complete resolution of the skin lesions. Together, these results provide the proof of concept, in macaque models that mirror human immunodeficiency virus type 1 infection, that a prime-boost approach with a highly attenuated poxvirus followed by Dryvax increases the safety of smallpox vaccination, and they highlight the importance of neutralizing antibodies in protection against virulent poxvirus.

PMID: 14551889 [PubMed - indexed for MEDLINE]

16: J Lab Clin Med. 2003 Oct;142(4):278.

Hands: the last great smallpox outbreak in Minnesota (1924-25).

Hammerschmidt DE.

Publication Types:
Historical Article

PMID: 14649244 [PubMed - indexed for MEDLINE]

17: J Lab Clin Med. 2003 Oct;142(4):211-5.

Smallpox: remembrance of things past, or the coming plague?

Janoff EN, Lynfield R.

Publication Types:
Editorial

PMID: 14625525 [PubMed - indexed for MEDLINE]

18: J Lab Clin Med. 2003 Oct;142(4):216-20.

Smallpox in history: the birth, death, and impact of a dread disease.

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Publication Types:
Historical Article
Review
Review, Tutorial

PMID: 14625526 [PubMed - indexed for MEDLINE]

19: J Lab Clin Med. 2003 Oct;142(4):221-8.

Smallpox and bioterrorism: public-health responses.

Hull HF, Danila R, Ehresmann K.

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There is great concern that smallpox could be used for bioterrorism. The disease has a high mortality rate and can be spread by aerosols, and immunity in the population

is low. Although an initial release of smallpox could infect a large number of people, secondary spread would likely be slow because of the long incubation period and the close contact required for transmission. Hospital personnel and household contacts are at the greatest risk of becoming infected. An outbreak of smallpox will be controlled through surveillance, containment, vaccination, and isolation of cases-the strategy used to eradicate the disease globally in 1978. Pre-exposure vaccination is recommended for hospital personnel likely to be exposed to smallpox while caring for patients during an outbreak.

Publication Types:
Review
Review, Tutorial

PMID: 14625527 [PubMed - indexed for MEDLINE]

20: J Lab Clin Med. 2003 Oct;142(4):229-38.

Rates and risks of transmission of smallpox and mechanisms of prevention.

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In 1980, the World Health Organization declared smallpox eradicated from the world; the last known natural case had occurred in Somalia in 1977, and the United States had stopped routinely vaccinating its citizens in 1972. However, with increasing concerns regarding domestic and international terrorism, smallpox has resurfaced as a potential threat to global health. We review the direct and indirect modes of smallpox transmission and how patterns of transmission vary substantially, depending on the severity of circulating disease, vaccination status, environmental and socioeconomic factors, and the setting of an outbreak. We examine mechanisms for controlling outbreaks of disease and preventing further transmission in the event of an outbreak, with an emphasis on smallpox vaccination.

Publication Types:
Review
Review, Tutorial

PMID: 14625528 [PubMed - indexed for MEDLINE]

21: J Lab Clin Med. 2003 Oct;142(4):239-45.

Current infection-control issues for smallpox disease and vaccinia vaccine.

Bennett ME, Ledell K.

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Publication Types:
Review
Review, Tutorial

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Smallpox vaccines: current and future.

Bonilla-Guerrero R, Poland GA.

Mayo Vaccine Research Group, Mayo Clinic and Foundation, Rochester, MN 55905, USA.

Publication Types:
Review
Review, Tutorial

PMID: 14625531 [PubMed - indexed for MEDLINE]

23: J Lab Clin Med. 2003 Oct;142(4):246-51.

Laboratory diagnosis to differentiate smallpox, vaccinia, and other vesicular/pustular illnesses.

Besser JM, Crouch NA, Sullivan M.

Public Health Laboratory, Minnesota Department of Public Health, Minneapolis, MN 55414, USA.

Publication Types:
Review
Review, Tutorial

PMID: 14625530 [PubMed - indexed for MEDLINE]

24: J Law Med Ethics. 2003 Summer;31(2):312-4.

Public health: Bush's smallpox vaccination plan.

Gray J.

Publication Types:
Historical Article

PMID: 12964276 [PubMed - indexed for MEDLINE]

25: J Perianesth Nurs. 2003 Oct;18(5):305-6.

A position statement on smallpox vaccination programs.

American Society of PeriAnesthesia Nurses.

PMID: 14569539 [PubMed - indexed for MEDLINE]

26: J Sch Nurs. 2003 Oct;19(5):260-4.

The smallpox threat: the school nurse's role.

Martin ME, Didion J.

Lucas County Educational Services ASP, St Rose School, Perrysburg, OH, USA.

Today, with the threat of bioterrorism and war, there is a new dimension to the traditional role of the school nurse. The smallpox threat to public health will invoke the school nurse's role as an educator, liaison, and consultant in the community. This article discusses smallpox, the vaccination process, adverse effects, and postvaccination care. In addition to the role of educator, the school nurse has the role of a liaison between the school and the local health department. The school nurse also plays a vital role in school health policy development and implementation. Being prepared and educated makes our nation less vulnerable to these threats and will assist in keeping our children and communities safe.

Publication Types:
Review
Review, Tutorial

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Lipkowitz E.

Northwestern University, Evanston, Ill, USA.

Publication Types:
Historical Article

PMID: 14600196 [PubMed - indexed for MEDLINE]

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Joseph DG.

Yale University, New Haven, Conn, USA.

Publication Types:
Historical Article

PMID: 14600197 [PubMed - indexed for MEDLINE]

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Comment on:
Lancet. 2003 Oct 25;362(9393):1378-80.

Myocarditis: the unexpected return of smallpox vaccine adverse events.

Chen RT, Lane JM.

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Publication Types:
Comment

PMID: 14585633 [PubMed - indexed for MEDLINE]

30: Lancet. 2003 Oct 25;362(9393):1378-80.

Comment in:
Lancet. 2003 Oct 25;362(9393):1345-6.

Eosinophilic-lymphocytic myocarditis after smallpox vaccination.

Murphy JG, Wright RS, Bruce GK, Baddour LM, Farrell MA, Edwards WD, Kita H, Cooper LT.

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Smallpox is an eradicated viral disease that has re-emerged as a potential bioterrorism threat. Smallpox vaccination was historically the most effective defence measure against wild smallpox virus. The risk of myopericarditis after vaccination might limit this option. We report a case of biopsy-proven eosinophilic-lymphocytic myocarditis diagnosed in vivo with histological evidence for eosinophil-mediated cardiac myocyte necrosis shortly after smallpox vaccination. Furthermore, we report a beneficial haemodynamic response to
high-dose corticosteroids. A better understanding of the aberrant immune mechanism of myocyte injury after smallpox vaccination might improve the

risk/benefit assessment for people considering smallpox vaccination and better smallpox vaccines in the future.

Publication Types:
Case Reports

PMID: 14585641 [PubMed - indexed for MEDLINE]

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Putting Jenner back in his place.

Scally G, Oliver I.

Regional Public Health Group, Government Office for the South West, BS1 6ED, Bristol, UK. gscally.gosw@go-regions.gsi.gov.uk

Publication Types:
Biography
Historical Article

Personal Name as Subject:
Jenner E

PMID: 14550693 [PubMed - indexed for MEDLINE]

32: MedGenMed. 2003 May 29;5(2):20.

Biodefense research: new tricks to fight old enemies.

Mariani SM; American Association of Immunologists.

Medscape General Medicine.

Publication Types:
Congresses

PMID: 14603119 [PubMed - indexed for MEDLINE]

33: Nat Med. 2003 Sep;9(9):1115-6.

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Nat Med. 2003 Sep;9(9):1125-30.
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Keeping the lock on smallpox.

Weiner DB.

Publication Types:
Comment
News

PMID: 12949522 [PubMed - indexed for MEDLINE]

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Nat Med. 2003 Sep;9(9):1115-6.

Clonal vaccinia virus grown in cell culture as a new smallpox vaccine.

Weltzin R, Liu J, Pugachev KV, Myers GA, Coughlin B, Blum PS, Nichols R, Johnson C, Cruz J, Kennedy JS, Ennis FA, Monath TP.

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Although the smallpox virus was eradicated over 20 years ago, its potential release through bioterrorism has generated renewed interest in vaccination. To develop a modern smallpox vaccine, we have adapted vaccinia virus that was derived from the existing Dryvax vaccine for growth in a human diploid cell line. We characterized six cloned and one uncloned vaccine candidates. One clone, designated ACAM1000, was chosen for development based on its comparability to Dryvax when tested in mice, rabbits and monkeys for virulence and immunogenicity. By most measures, ACAM1000 was less virulent than Dryvax. We compared ACAM1000 and Dryvax in a randomized, double-blind human clinical study.
The vaccines were equivalent in their ability to produce major cutaneous reactions ('takes') and to induce neutralizing antibody and cell-mediated immunity against vaccinia virus.

Publication Types:
Clinical Trial
Randomized Controlled Trial

PMID: 12925845 [PubMed - indexed for MEDLINE]

35: Nat Med. 2003 Sep;9(9):1131-7. Epub 2003 Aug 17.

Comment in:
Nat Med. 2003 Sep;9(9):1115-6.

Duration of antiviral immunity after smallpox vaccination.

Hammarlund E, Lewis MW, Hansen SG, Strelow LI, Nelson JA, Sexton GJ, Hanifin JM, Slifka MK.

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Although naturally occurring smallpox was eliminated through the efforts of the World Health Organization Global Eradication Program, it remains possible that smallpox could be intentionally released. Here we examine the magnitude and duration of antiviral immunity induced by one or more smallpox vaccinations. We found that more than 90% of volunteers vaccinated 25-75 years ago still maintain substantial humoral or cellular immunity (or both) against vaccinia, the virus used to vaccinate against smallpox. Antiviral antibody responses remained stable between 1-75 years after vaccination, whereas antiviral T-cell responses declined slowly, with a half-life of 8-15 years. If these levels of immunity are considered to be at least partially protective, then the morbidity and mortality associated with an intentional smallpox outbreak would be substantially reduced because of pre-existing immunity in a large number of previously vaccinated individuals.

PMID: 12925846 [PubMed - indexed for MEDLINE]

36: Optometry. 2003 Sep;74(9):583-98.

Smallpox and smallpox vaccine: ocular and systemic risks and ethical uncertainties.

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BACKGROUND: The threat of bioterrorism and use of biological weapons has drawn renewed attention to smallpox, and smallpox vaccinations have been resumed in the United States. Both smallpox and smallpox vaccine carry risk of potentially debilitating or fatal adverse effects. The optometrist must be familiar with the signs and symptoms of smallpox disease and complications of smallpox vaccine for proper management and preservation of vision. OVERVIEW: The literature on the ocular and systemic effects of smallpox and smallpox vaccination is reviewed to provide the practicing optometrist with an overview of the issues involved in case management. Recent guidelines have placed additional ocular-related contraindications to receiving the smallpox vaccine. Risk factors for complications arising from smallpox vaccination are discussed. A discussion of the ethical implications is also presented. CONCLUSIONS: Knowledge of the signs and symptoms of smallpox infection, and of adverse effects caused by smallpox vaccination, can provide the necessary background to help eye care providers make appropriate diagnoses and referrals. Understanding ethical and legal/Constitutional questions surrounding the risk of outbreak and various vaccination containment strategies will help optometrists make informed decisions as health care professionals, patient advocates, and concerned citizens, as well as weigh the risks and benefits of vaccination, if it is offered to them.

Publication Types:
Review
Review, Tutorial

PMID: 14515981 [PubMed - indexed for MEDLINE]

37: Semin Respir Infect. 2003 Sep;18(3):196-205.

Smallpox.

Gooze LL, Hughes EC.

Santa Clara Valley Medical Center, San Jose, CA, USA.

Until the 1970s, smallpox was feared worldwide for the significant morbidity and mortality it caused. Although naturally occurring disease has been eliminated, the virus itself has not been destroyed, and it is assumed that some of the variola stored in the former Soviet Union has been removed. The majority of the world's population is susceptible to smallpox because vaccination ended in 1972 in the United States and in the rest of the world in 1982. A major epidemic could result if there was an intentional release of smallpox. Variola is both durable and highly infective, 2 features that make it an attractive bioweapon.
Because of this threat, physicians should be familiar with the clinical features of smallpox and the appropriate isolation and medical response procedures. Although there is a vaccine that can provide pre- and postexposure protection, the vaccination itself is not without risks. There is no effective therapy for smallpox and studies of new treatments are underway.

Publication Types:
Review
Review, Tutorial

PMID: 14505281 [PubMed - indexed for MEDLINE]